

owls in several different ways. For example, barred owls are slightly heavier in body mass than spotted owls, take a wider variety of prey, have smaller home ranges which they defend more rigorously, and are more diurnal in their activity patterns. Barred owls seldom "lose" in territorial interactions with spotted owls. Barred owls have continued to expand their range in the Pacific Northwest and now can be found in several hundred locations in Washington, some 260 locations in Oregon, and 17 locations in California. A wide range of species have been observed to mob spotted owls. Mobbing species may frequently make physical contact with spotted owls, ruffling the owl's feathers or, in some instances, knocking spotted owls from their perches. The following species have been observed to mob spotted owls: hermit thrush, Swainson's thrush, varied thrush, Cooper's hawk, black-capped and mountain chickadees, red-breasted nuthatch, rufous hummingbird, dark-eyed juncos, hermit warbler, golden-crowned kinglet, Steller's jay, gray jay, northern pygmy owl, and sharpshinned hawk. The latter four species have more commonly been observed making physical contact with spotted owls. Great horned owls have been identified as the primary predator on spotted owls. As old-growth forests become fragmented through logging or natural processes, it is hypothesized that great horned owls become established and increase in numbers as this new niche is created. I conducted a nocturnal survey in 1989 and 1990 to locate great horned owls and spotted owls throughout the range of forest fragmentation levels in the Central Cascades of Oregon. Forest fragmentation levels ranged from landscapes (>500 ha in size) containing intact stands of mature/old-growth forest (0% fragmentation) to landscapes containing younger stands with no mature/old-growth forest (100% fragmentation). Six survey visits were made to each of 469 calling stations located along 28 roadside survey routes. Relative abundance for great horned owls and spotted owls was 0.069 and 0.139 owls/road km, respectively. Thirteen habitat/landscape variables within 500-ha circular landscape plots surrounding great horned owl, spotted owl, and random points were assessed. Significant differences existed between great horned owl and spotted owl landscapes for six variables: great horned owl landscapes contained more shrub/forb and shelterwood, less mature/old-growth and mature/old-growth interior habitat, had a higher linear edge-to-mature/old-growth area ratio, and were higher in elevation than spotted owl landscapes. The greatest number of great horned owl responses were associated with landscapes containing 10–20% old forest. Great horned owl responses generally declined with increasing amounts of old forest, and few (11%) great horned owls were detected in landscapes containing $\geq 70\%$ old forest. The majority (62%) of spotted owls were detected within landscapes containing $\geq 60\%$ old forest. Spotted owl responses generally declined with declining amounts of old forest and few (7%) spotted owls were detected within landscapes containing $\leq 20\%$ old forest.

INVENTORY AND MONITORING PROGRAMS FOR NORTHERN SPOTTED OWLS

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The annual inventory and monitoring of northern spotted owls has become a tradition for many wildlife biologists working for federal and state agencies, universities, private consultants and private timber companies in the Pacific Northwest. Current survey programs are founded on the efforts of biologists that began the search for owls over two decades ago. Pioneer work by Eric Forsman in Oregon and Gordon Gould in California was instrumental in developing and refining standard survey techniques essential to conducting an inventory. In the 1970s, the Forest Service and Bureau of Land Management took the inventory lead by surveying for spotted owl occurrence on lands they administered. This provided the first operational extension of the work of Forsman and Gould. Through the 1970s and early 1980s, agency surveys focused on locating territorial owls to provide basic information for planning timber sales and making land use planning decisions. Survey work for the 1980s decade turned to monitoring owl response to land use decisions and incremental inventory of lands not previously surveyed. During this time period, the use of offered prey called 'mousing' and the implementation of banding added new dimensions to the inventory and monitoring programs. The listing of the spotted owl as a federal threatened species in 1990 accentuated the importance of ongoing work and set in motion intensive efforts by government and private interests to inventory proposed timber sale areas to ensure compliance with the Endangered Species Act. Through inventory and monitoring, knowledge has been gained on the distribution of owls, the relationship of occurrence to forest condition, dispersal movements and reproductive success. The programs, although productive, were not without shortcomings. Some local programs were keyed to finding owls, but lacked clear objectives and plans for data analysis. On a regional scale, poor coordination between agencies, lack of a central data storage and retrieval system and inconsistent formats for data recording were detractions. Fortunately these problems have been identified. The future affords the opportunity to learn from past experience and to establish a single, cooperative spotted owl inventory and monitoring program with common goals and objectives.

HISTORY OF CONSERVATION PLANNING FOR THE NORTHERN SPOTTED OWL

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